Adapting to a Changing Climate Workshop Report

Tumon, Guam
March 10-14, 2014

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Background

In 2010, The Micronesia Conservation Trust (MCT) supported the development of community based climate change (CC) adaptation tools for the Micronesia region. To design the most appropriate and useable products, consultants reviewed existing CC adaptation materials, spoke with various climate experts, and held a regional workshop with regional natural resource managers, community members, and climate change experts. Based on input at this workshop, the following products were developed:

Adapting to a Changing Climate Outreach Toolkit[1] - which is designed to provide community members and stakeholders with an understanding of climate change concepts and adaptation strategies. This toolkit consists of:

- Large flipcharts visually depicting climate change concepts and actions that can be carried out to prepare and adapt to CC impacts.
- Facilitators guide to accompany the flipcharts, which include page-by-page notes on things to point out on the flipchart and concepts to explain.
- Booklets that provide the same visual content as the flipchart but offer more verbal description and explanations. These are to be used by community members and other stakeholders both during presentation of the flip chart material and afterward as they work on their adaptation projects.

Revised PIMPAC management planning guidance[1], which now includes a climate change lens through:

- Revised steps that ensure important stakeholders are involved and key questions are answered to address climate change in the planning process
- New steps including historical timeline, seasonal calendar, strength/weakness analysis, and vulnerability assessment to help understand the social and biological resource vulnerability to the impacts of climate change.

This workshop focused on training a team of practitioners in Guam on the use of these tools.

Funding for the workshop was provided by the Nature Conservancy Micronesia Program, and the NOAA Coral Reef Conservation Program. The workshop was hosted by the Guam Bureau of Statistics and Planning.

[1] Since the completion of the first phase of this project, much of the Outreach tool and the revised PIMPAC management planning guidance have been combined into one streamlined process and further revised in collaboration with Micronesia Conservation Trust and the US Coral Triangle Initiative and is now called *Adapting to A Changing Climate: Guidance for Local Early Action Planning (LEAP) and Management Planning*.

Workshop Objectives

1. To provide agency participants from various sectors in Guam with the understanding of climate change, the potential impacts to Guam, and necessary skills to effectively communicate climate change concepts.

2. To provide participants with skills and tools for facilitating participatory activities (e.g. field based vulnerability assessments) that result in actions that reduce vulnerability to climate change and other threats.

3. To share climate change adaptation training outputs with agency leaders and policy makers to gain support and guidance for further adaptation efforts.

4. To develop a timeline for participants to utilize the skills and tools from the workshop to carry out follow up activities

5. To share Pacific tools with Caribbean Learning Exchange participants to build skills, and collect feedback on how the tools could be used and modified for the Caribbean. (Belize, Grenada, and Puerto Rico)

Workshop Participation

The training was attended by approximately 35 people (participants and trainers). Participants represented various government agencies and non-governmental organizations within Guam. Participants included:

Last Name	First Name	Agency/ Organization
Black	Sheena	Office of the Governor
Brown	Valerie	NOAA Fisheries
Calvo	John	Western Pacific Regional Fisheries Council
Camacho	Christine	Bureau of Statistics and Planning
Constantino	Ambrosio	Homeland Security
Denney	Peggy	
Gawel	Mike	National Park Service
Gofigan	Fred	
Hadley	Alison	University of Guam
King	Romina	University of Guam

Lander	Mark	University of Guam
Leon Guerrero	Carlotta	
Loerzel	Adrienne	NOAA Coral Reef Conservation Program
Lujan	Vangie	Guam Water Works
Mafnas	Joseph	
Marra	John	NOAA Climate Services
Miller	Genevieve	
Miller	Roxanna	University of Guam Center for Island Sustainability
Parker	Aaron	
Perez	Terry	Bureau of Statistics and Planning
Quinata	Tom	Bureau of Statistics and Planning
Quinata	Marybelle	NOAA Fisheries
Quitugua	Roland	University of Guam
Richardson	Jim	National Park Service
Simpson	Clint	NOAA National Weather Service
Taft	Tammy Jo	Guam Environmental Protection Agency
Tyler	Elvie	University of Guam Center for Island Sustainability
Caribbean Participants		
Barriteau	Martin	Sustainable Grenadines
Budna	Norman	Toledo Institute for People and Environment, Belize
Frederick	Naella	The Nature Conservancy, Grenada
Justiniano	Aurora	The Nature Conservancy, Puerto Rico
MacGowan	Petra	The Nature Conservancy, Reef Resilience Program
Wagner	Cherie	The Nature Conservancy, Reef Resilience Program
Facilitators		
Gombos	Meghan	Pacific Islands Managed and Protected Area Community
Leberer	Trina	The Nature Conservancy, Micronesia

PIMPAC regional advisor Meghan Gombos, and the Nature Conservancy's Micronesia Program Director, Trina Leberer, facilitated the workshop. Additional field experts were also invited to share some of the latest science around climate change and potential impacts to Guam. These included:

1. John Marra – NOAA Climate Services
2. Mark Lander – University of Guam, Water and Environmental Research Institute
3. Val Brown – NOAA Fisheries on behalf of Dave Burdick of University of Guam

Workshop Approach & Outputs

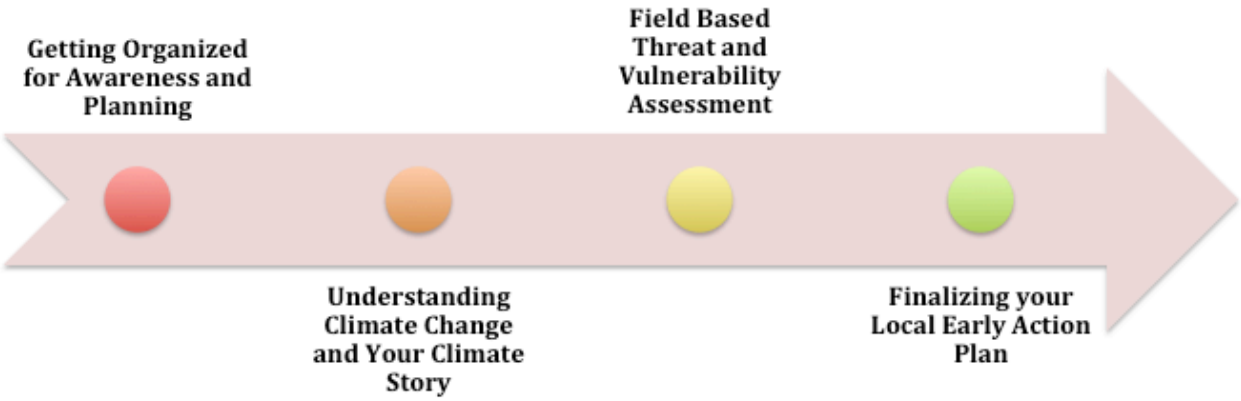
The workshop utilized a variety of methods including lectures, group discussions, classroom exercises, and fieldwork to help participants understand climate change concepts and practice utilizing the toolkit to carry out climate change outreach, vulnerability assessments, and adaptation planning. The training was broken into 2 sessions. The sessions included:

> ***Session One: Understanding and Communicating Climate Change Concepts*** - The first session was aimed at ensuring that all participants have a solid understanding of climate change concepts so that they can provide accurate information to target audiences about climate change and climate variability. It included information on the best available projections for Guam and discussions on the potential impacts to various natural resource and social targets. It also included the use of participatory tools to help target audiences understand specific concepts and collect local information on changes in climate (i.e. historical timeline, and seasonal calendar). The output of Session One was a local climate story that describes climate impacts the community is most concerned about and why, based on past and present experience, and potential future scenarios.
>
> ***Session Two: Threat and Vulnerability Assessment and Adaptation Planning (Days 3-5)*** Session Two built on the information learned in the Session One to support adaptation planning. In this session, participants; 1) learned specific terms to describe the different components of vulnerability (natural resource and social), 2) practiced completing a threat and vulnerability assessment in the field, and 3) developed early actions or adaptation strategies to address key threats and vulnerabilities. The outputs of the full week were shared with agency and community leaders to gain support on further climate change efforts.

The rest of this report will capture the main activities and outputs from these sessions.

Session One: Understanding and Communicating Climate Change Concepts

Session One began by first providing an overview of the Adapting to a Changing Climate: Guide for Local Early Action Planning (LEAP) and Management Planning tool. The group reviewed the four steps that would be completed throughout the workshop and for the development of a Local Early Action Plan. They also reviewed the first step focused on getting organized for Awareness and Planning which included actions such as developing a planning team, defining the geographic area for planning, defining stakeholders, and ensuring they have authority to plan for the area.



The rest of Session One focused on using the new CC outreach materials including the flipchart illustrations and participatory exercises to understand climate change concepts and discuss ways to communicate key messages to communities.

Factors that Contribute to a Healthy or Unhealthy Community

To begin participants were asked to describe, "What factors contribute to a community being healthy or unhealthy?". The table below captures information that group listed to answer this question. These answers were then compared to the illustrations and information provided in the toolkit to generate discussion. The focus of this discussion was to demonstrate that several existing local (i.e. non-climate) threats are impacting communities and that the current condition of local natural and social resources will greatly influence how they are impacted by climate change. Resources that are facing several existing local threats will likely be more negatively impacted by climate change.

Factors that Contribute to a Healthy Community	Factors that Contribute to an Unhealthy Community
• Clean and sufficient freshwater supply • Living without flooding • Safe homes • Ability to catch or produce your own food • Parks • Effective waste management • Safe environment from hazards • Bike paths • Strong respect for family • Strong social networks • Strong leadership	• Drugs • Crime • Unemployment • Poor unstable infrastructure • Unsustainable environmental practices • Corrupt government • Drought • Fast food • Outside intervention • Lack of education • Lack of leadership / community structure /

• Healthy forests, lakes, natural resources—coral • Public safety • Enforcement • Access to education • Best community practices • Healthy humans • Access to information • Employment • Cultural preservation and perpetuation • Traditional knowledge • Effective mass transit	guidance • Misuse of natural resources • Lacking prioritization of agriculture and natural resources • Improper storage of chemicals • Lack of community development plan • Apathy • Invasive species • Overpopulation • Natural disasters • Poverty • Sole reliance on imports • Overdevelopment

Developing a Local Climate Story

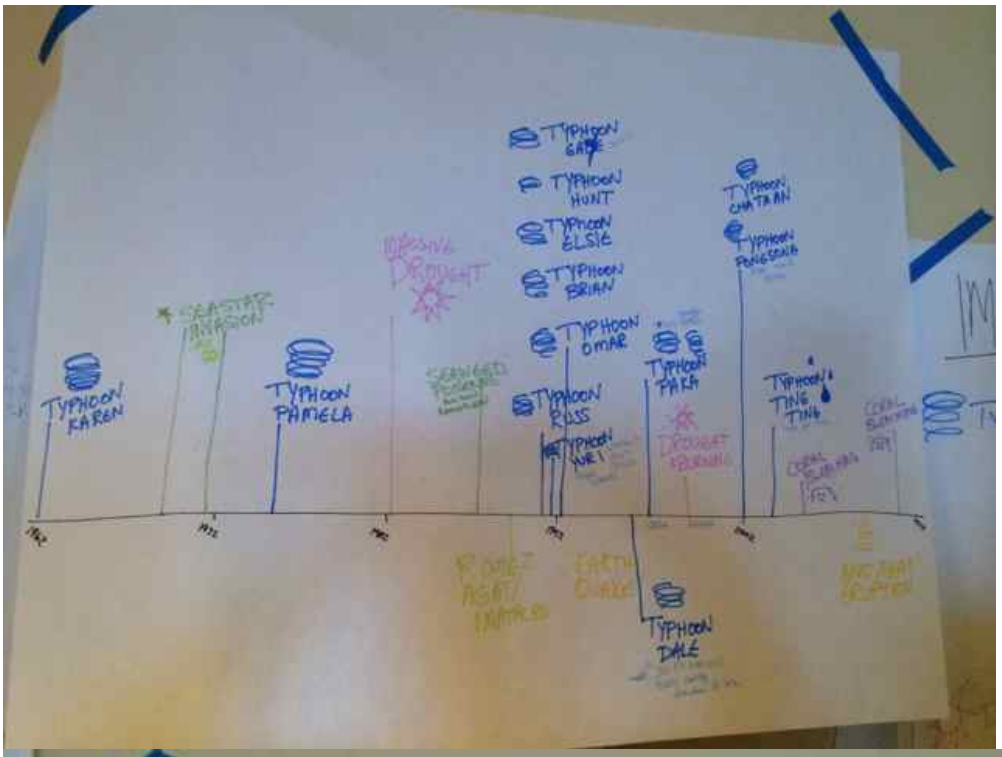
Next the group began reviewing material and completing activities that would help them develop "a local climate story" for Guam. A local climate story explains past, current and projected climate hazards, and impacts the community is most concerned about.

Historical Timeline

To develop the story, the group began by reviewing toolkit illustrations and key messages about the following topics:

- What is difference between weather and climate?
- El Niño & La Niña

The "historical timeline" is a participatory exercise that was used to explore historical natural/climate events that have occurred in the past 50+ years in Guam. The timeline was used to identify which extreme climate events have happened in the past, impacts those events had on the community, and ways the community coped with those impacts. The group also focused on looking at how some of the past climate events may have been due to natural climate variability, and specifically the influence of El Niño & La Niña impacts to weather patterns in the region. An example of the outputs from this exercise is pasted below.


TYPHOON KAREN
TYPHOON PAMELA
TYPHOON HUNT
TYPHOON ELSIE
TYPHOON BRIAN
TYPHOON OMAR
TYPHOON RUSS
TYPHOON FARA
TYPHOON DALE
TYPHOON CHATAAN
TYPHOON PONGSONA
TYPHOON TINA TINA


IMPACTS
TYPHOONS
-Power loss
-No water
Boil Native
Bacteria
-Fuel issues
-Transportation
-Crop loss
-Farms leveled
-Flooding
-Animal loss
-Destroyed home
-Displaced people
-Food/Lots of BBQ
-Coastal Erosion
-Education loss
-schools damaged
DROUGHT
COPING TECHNIQUES
-Family BBQ
-Cold showers
-Early to bed, early to rise
-Stay close to home
-Salvage as much as possible
-Go off Island
-Generators
-FEMA for some
-military helped w/water
-Government Agencies kick into high gear
-Develop building codes

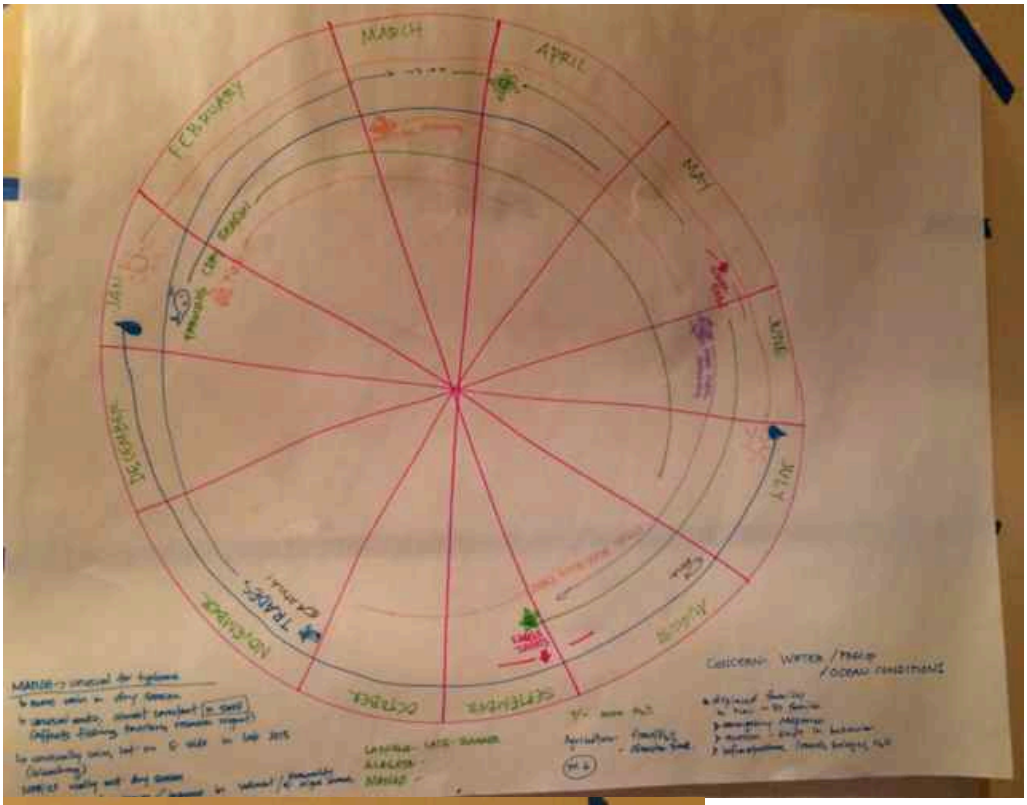
Next the group reviewed toolkit illustrations and key messages on the following topics:

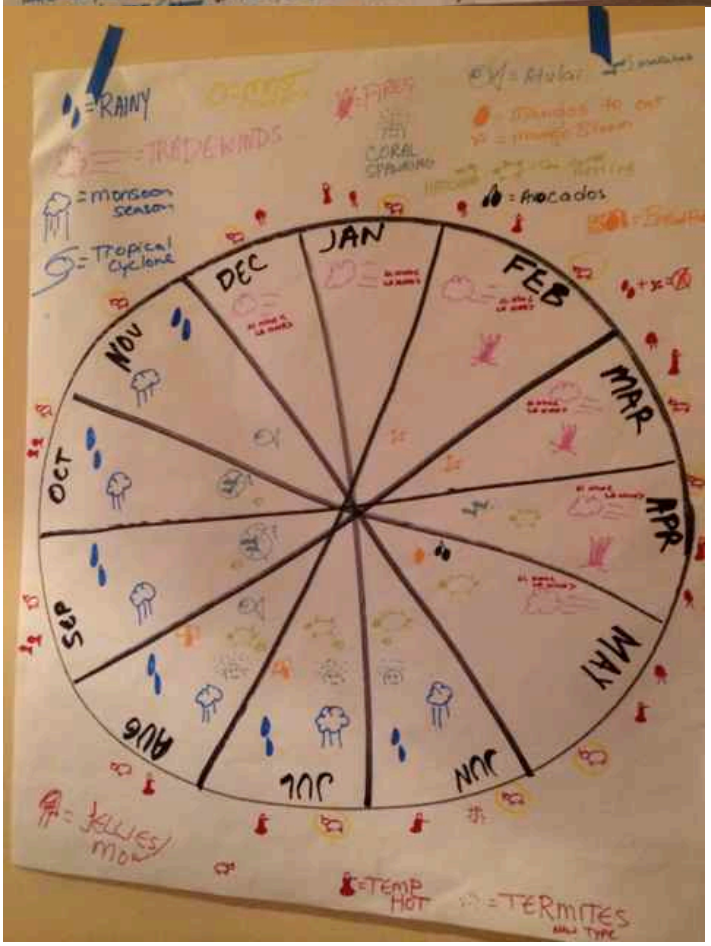
- What is Climate Change?
- Why is Climate Change Happening?
- What are the Potential Impacts from Climate Change?

In addition to the toolkit illustrations, John Marra of NOAA Climate Services Pacific Region provided information about recent science on climate change (e.g. CO2 emission trends) and climate variability (e.g. El Niño Southern Oscillation and Pacific Decadal Oscillation). John also provided information on potential impacts of climate change on coastal systems. Additionally, Mark Lander of University of Guam provided information on potential changes to weather patterns and extreme events such as typhoons to Guam. Finally, Val Brown of NOAA Fisheries presented on behalf of Dave Burdick (UoG), on the potential impacts of climate change on Guam's marine ecosystems.

Seasonal Calendar

To engage participants in the discussion of local impacts, seasonal calendars were developed to explore changes they are noticing to normal seasons and associated events. This exercise was used to capture the "normal" seasons and natural and social events that occur within them and to begin identifying how those seasons may be shifting due to climate change and variability and what the impacts may be as a result. Outputs of this exercise are pasted below.


MARCH
APRIL
FEBRUARY
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY
TRADES
CORAL SPAWNING
WATER / MARINE / OCEANIC CONDITIONS


=RAINY
=TRADEWINDS
=monsoon season
=Tropical Cyclone
CORAL SPAWNING
=Avocados
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
=JELLIES
=TEMP HOT
=TERMITES

Potential Future Impacts from Climate Change to the Communities of Umatac and Tumon

With a better understanding of 1) historical climate events that impacted Guam communities, 2) changes to normal seasons being observed, and 3) climate change science and projections participants broke into small groups to discuss how climate change might impact the specific Guam communities of Umatac and Tumon. To do this, the group split into two groups to further review climate projections provided by NOAA Climate Services in a simplified format (found in Appendix B). Each group discussed specifically how those projections might impact the natural resources and social systems in their respective community. Upon completing and reviewing the list of potential impacts, the group prioritized what they considered the most critical impacts of concern.

The complete list and prioritized list are found below.

Umatac Climate Impacts of Concern

Climate Indicator	Short Term	Long Term
Air Temperature	Fire Risk	Erosion / loss of resiliency
	Vegetation –agriculture and forest habitat	Erosion / loss of resiliency Biodiversity loss
	Infrastructure	Economic cost for system and individuals
	Health	
Rainfall	Agriculture	Chemical Use – water quality, economics, nutrients, coral fisheries
Extremes - Flooding	Resource managers Infrastructure Emergency response Displacement Cemetery Cultural practices	Access/ remoteness Economics (costs) H2O
Extremes – typhoon drought	" "	
Sea Level Rise	Flooding – minor nuisance/tidal Variability – coastal erosion	Potential location shifts

	Community center	
Sea Surface Temperature	Reef is already stressed Fish kills?	Bleaching possibility Phase shifts
	Cultural impacts Fisheries Community events/ food source/ cultural	
Upper ocean heat content/ stratification	Fish patterns?	
Ocean Chemistry	Coral Health Fisheries Cultural impacts	Ecosystem Shift
Overall – all CC impacts	Migration Subsistence Fisheries Land Use Resource use conflicts Infrastructure	Population Increase
Top Climate Change Impacts of Concern for Umatac: • **Impacts to Coral** • **Flooding** • **Increased Fire** • **Population** • **Cultural Impacts** • **Typhoons**		

Tumon Climate Impacts of Concern

Climate Indicator	Impact
Increased Air Temperature	• Increase in indoor activities • Less walking/ increased traffic/ Increase in obesity • More nightlife activities • Added pressure on GMH (i.e. more heat stroke) • Increased water for hotel landscaping/ electricity for aircon • More road repair • Reduction in tourism • Increase cost for construction/ infrastructure/ utilities • Increase in night crime rate (increased nightlife)
Rainfall (moderate increase)	• Increase in urban flooding • Increase in sewer overflow • Decrease in salinity (in some areas) – affect on marine life

	• Algae blooms • Landslides along cliffs • Increase in invasive species • More pests/ disease in plants • More mosquitoes and mosquito borne disease • Reduced tourism • More shopping
Strong Winds/ High seas	• Choppy waters/ Increased drowning accidents • Vegetative power outages • Flying dust/debris – more clean up • Marine debris • Impact on corals (e.g. standing on corals due to choppy water) • Public safety hazards
Drought	• Increased infrastructure (immagration) • Loss/ stress on native vegetation • Increase pests/diseases in plants • Increase of boiled water • Decrease in tourism
Sea Level Rise (moderate increase)	• Shoreline erosion • Demand for sea walls • Flooding • Inundation • Salt water lens will increase • Salt water intrusion to wells
Sea Surface Temperature	• Coral bleaching and fish impacts • Disease increase • Marine disease • Spawning impact
Upper ocean heat content/ stratification	• Possible shift in pelagic fish
Ocean Chemistry	• Decreased growth of coral • Decrease in fish larval survival
Top Climate Change Impacts of Concern for Tumon: • **Increased shoreline erosion/ Demand for Seawalls** • **Increase in urban flooding** • **Coral Bleaching** • **Increase in sewer overflow** • **More pests/ disease in plants** • **Inundation** • **Less outdoor activities**	

Local Climate Story Development

Based on the groups review of past, present, and possible future impacts, they were able to draft a "local climate story" to describe the climate hazards and impacts of most concern for Umatac and Tumon. Stories are presented below:

Umatac Community Climate Story

In the past, our ancestors became more resilient communities by coping with disruptive events, involving geologic and climate changes. Over time, the community succeeding by adapting to challenges from typhoons, earthquakes, and usual season events. To cope with coastal events, homes were built and elevated on stilts, *papa' sa'gi*. Throughout all these events, Umatac has preserved and maintained cultural practices of fishing, such as the manahak run and strong sense of community.

Our community is also seeing a change it the way it the amount and the timing of our rains. Dryer dry seasons could mean more fires. More heavy rain events could mean more flooding in homes and on our roads. Both fires and floods can cause more soil to wash out into our bays. These sediments, combined with warmer ocean water waters, threaten the health of our coral reefs. Our families and our community still depends on these reefs for food and village activity, and dead coral reefs will lead to less fish and less opportunity to connect as a village.
The three hazards that were identified as having the greatest potential impact on Umatac are increased sea surface temperature, sea level rise, and extreme weather conditions. The expected/ potential impacts of these hazards are coral degradation from upland erosion due flooding, fires, and drought with the consequent of sedimentation. The degradation of corals and the sin-shore fisheries would have a highly negative impact on the community of Umatac and its culture. For the future, we hope to establish infrastructure that can withstand expected population increase and pressure on our resources in Umatac. We also need to address Umatac's flooding, coastal, and ocean resource issues now, so that we will be prepared as more typhoons and other disruptive events.

Tumon Community Climate Story

In the 1960s to 1990s Guam was a very different place. Most families lived in structures that were not 100% concrete. People raised chickens and pigs and used suruhanus instead of GMH. Families fished together and no one had sewer connection. Seasons were of the utmost importance for farming and fishing. The main weather event that was significant enough that people use it to tell time, was the typhoon. As Guam changed, many things were added including concrete roofs, hotels, paved roads, sewer systems and more grocery stores. Some ways of life were lost and in times of disaster the recovery efforts changed. People during that time relied mostly on each other that changed and people began turning to government assistance to fix the newly adopted lifestyle and infrastructure.

We are seeing more rainfall, high seas out of season, urban flooding and an increase in tourism due to cold weather in temperate regions. Due to urban flooding we are seeing and increase in runoff into Tumon Bay which causes traffic congestion, the need to service storm drains more

often, and increase in bacteria loads in the water, and algal blooms. There's also an increase in safety concerns due to high seas and the incidence of drowning. Some hotels are also talking about putting up seawalls.

Future climate projection indicate that Guam will experience increased air temperatures, sea temperatures and rain fall during the wet season. Under these conditions Tumon is likely to experience increased urban flooding which may damage key infrastructure assets and increase human health impacts due to sewage overflows. Moderately higher sea levels coupled with increased waves and wind will lead to accelerated coastal erosion which could affect key infrastructure which could affect services available for tourism. The frequency of coral bleaching events will increase due to higher sea surface temperatures which may have significant impacts to reef resources. All of these combined could have significant impacts on tourism and the overall economy of Guam.

Session Two: Threat and Vulnerability Assessment and Adaptation Planning

Session Two was aimed at building on the local climate stories for Umatac and Tumon, to complete field-based vulnerability assessments and develop adaptation strategies that address root causes of threats and vulnerabilities for priority targets in these communities.

Developing a Community Profile and Prioritizing Targets

To do this the group first began by developing a "community profile" for the Umatac and Tumon communities. The profile provides key information about natural resources and socio-economic characteristics of the site that can help support the vulnerability assessment and development of early actions to address vulnerabilities. It includes identifying information such as the main income generating activities which can then be considered when deciding what targets to focus the vulnerability assessment on. For example if fishing or tourism are main income generating activities the threat and vulnerability assessment should include fish and/or coastlines/beaches. The Tumon community profile is included in Appendix C.

Based on the information collected through the local climate stories and community profiles, the group chose the following targets to focus on for the field based vulnerability assessments:

Umatac

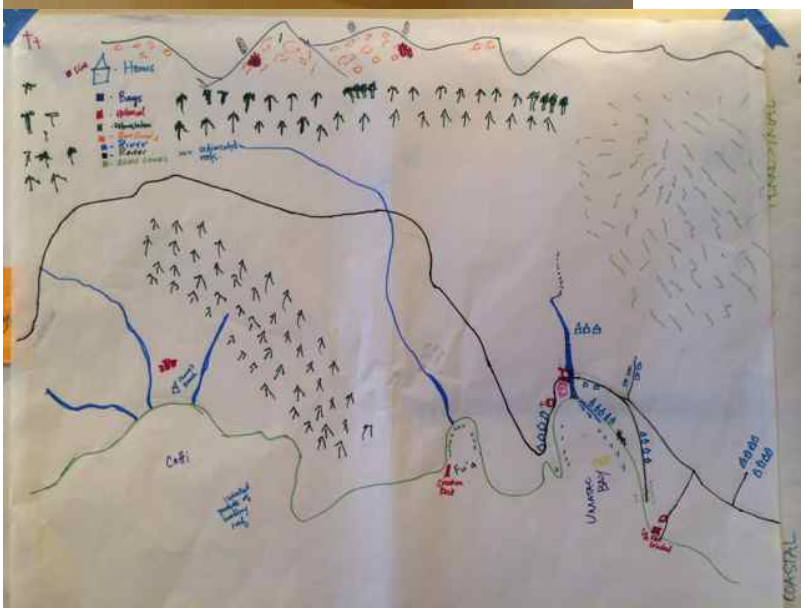
1. Coral Reefs – based on potential impacts to cultural practices and subsistence fisheries if corals are negatively impacted by increased sea surface temperatures and ocean acidification.
2. Upland Forests – based on potential for increased upland fires, which will cause more upland erosion and landslides as well as sedimentation on reefs. Fires may become worse with increased air temperatures and drier dry seasons.

Tumon

1. Shoreline – based on impacts to beaches and tourism. Increased rates of shoreline erosion may occur with higher sea levels and increased storm surges. This may create a demand for sea walls.
2. Infrastructure (stormwater/wastewater) – based on potential negative health and tourism impacts from increases in coastal flooding with wetter wet seasons, and sea level rise.

Mapping the Site

To prepare for the vulnerability assessment the group developed perception maps of the Umatac and Tumon communities to identify where key targets were located, where important social activities took place, and areas that were impacted by past climate events. These maps were used to help inform vulnerability assessment planning and discussion. The following are pictures of these maps:



Field-based Threat and Vulnerability Assessments

Prior to going into the field the group focused on understanding climate change concepts that are being used globally to discuss climate change adaptation and are critical for community

facilitators to complete a vulnerability assessments and write reports and grant proposals regarding climate adaptation. These terms include Vulnerability, Sensitivity, Exposure, Potential Impact, Adaptive Capacity, and Resilience. As part of this exercise in understanding these terms, workshop participants were asked to describe what exposure, sensitivity, adaptive, resilient, and vulnerable meant in an everyday situations rather than climate change. Although these words may not have the "same" meaning as the climate change term, they can be helpful when used to explain the concept behind the term, develop analogies, or consider for translation into local languages.

Over two days the group carried out vulnerability assessments for the two priority targets for both Umatac and Tumon. In each community field visit, participants broke into two small groups to view their target (where possible) and discuss the following:

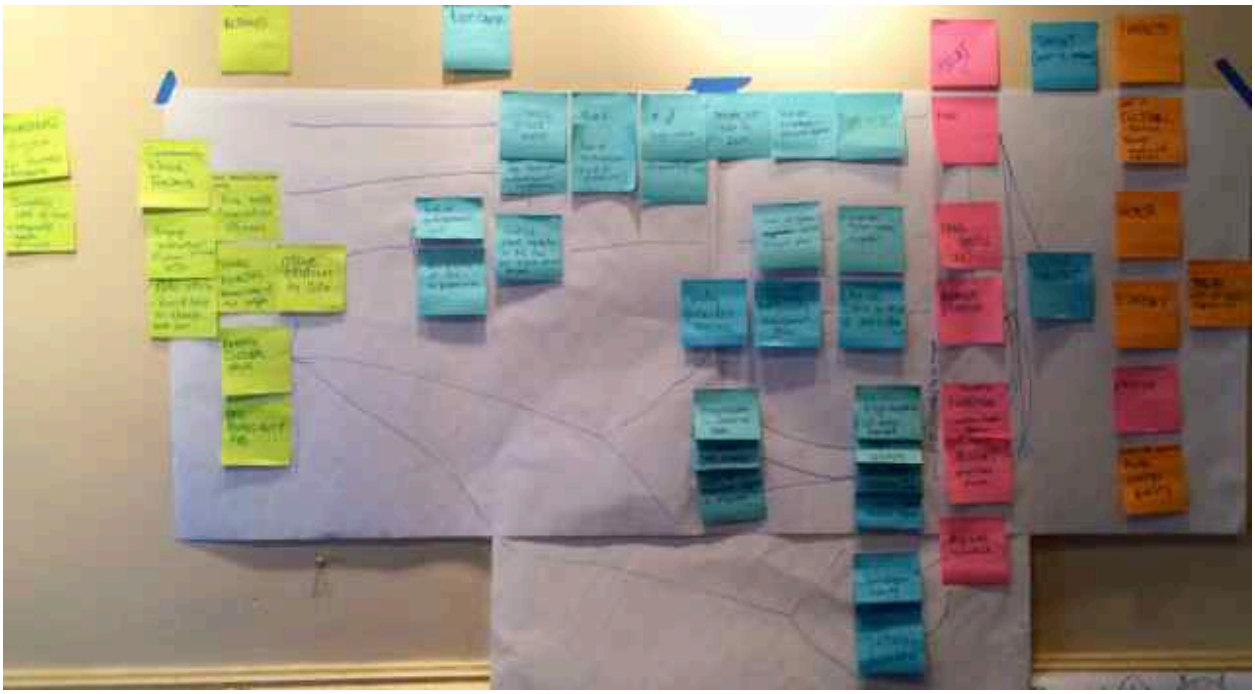
- Current condition of the target
- Non-climate threats and root causes of those threats on the target
- Existing and potential climate hazards that could impact the target
- Exposure, Sensitivity, Potential Impact, Adaptive Capacity and Vulnerability of the target to climate hazards
- Vulnerability of the community to potential changes in the resource (particularly highly vulnerable resources)

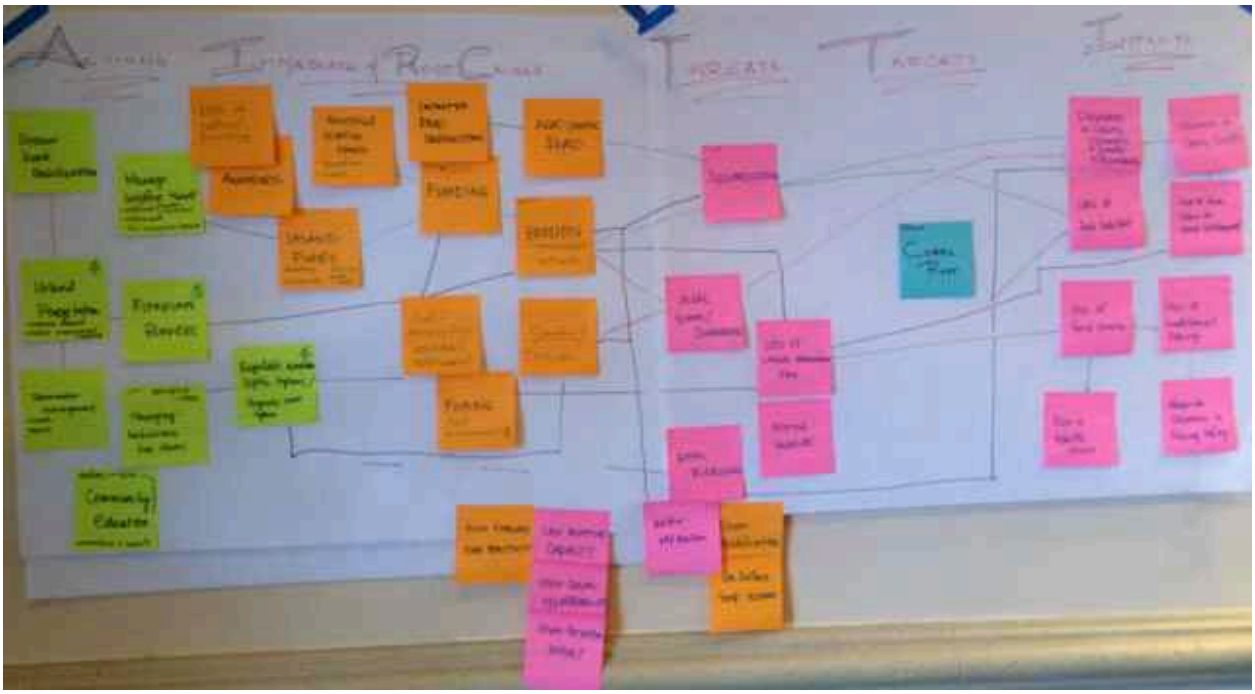
The field trip helped participants relate climate change concepts to real examples and gain a better understanding ways to understand vulnerability and therefore meaningful actions that could be taken to reduce vulnerability.

Threat Action Models

To further discuss and visually depict the information collected during the threat and vulnerability assessments, the group completed threat action models. These conceptual models are a way to map out the links between targets, non-climate threats and climate vulnerability, and root causes of threats and vulnerability. It also helps groups identify actions that will best address root causes of threats and vulnerability. Photos of some of the threat action models are provided below. An excel spreadsheets of these results can be also be viewed in Appendix D.


ROOT CAUSE
THREATS
TARGET
EROSION
STOP SPOT ZONE CHANGES
BUSINESS COMMUNITY
EDUCATION
POLITICAL LEADERS
NEW DEVELOPMENT
ALTERNATIVE OR OTHER DEVELOPMENT AREAS
UPDATE WATERFRONT REVITALIZATION PLANS
PRIORITIZE AREAS FOR PROTECTION
POLITICAL INTERFERENCE
SHIFT OF VALUES
INCREASED POPULATION & TOURISM
LACK OF UNDERSTANDING
APATHY
COCONUT RHINO BEETLE
LOSS OF VEGETATION
LACK/LOW ENFORCEMENT
NEW HOTEL OWNERSHIP
ECONOMIC SHORT-TERM BENEFIT
ALGAE BLOOMS
AESTHETICS
IMPROPER DEVELOPMENT PRACTICES
BEACH RAKE
STORM SURGE
HOTTER WEATHER
CHRONIC FLOODING
NATURAL SHORE LINE
STORM WATER FLOODING
EROSION
LOSS OF HABITAT
REDUCED FOOD SOURCE FOR ANIMALS
LOSS OF BEACH ACCESS
NUTRIENT POOR WATER
INCREASED ALGAE BLOOMS
SOCIAL VULNERABILITY
HIGH
ADAPTIVE CAPACITY
SHORT
LONG TERM





Taking the Workshop to the Next Level

To conclude the workshop, participants were asked to develop a timeline and activities to move climate change working forward through the use of the skills and tools gained in the workshop. The following are actions and needs the group identified to continue using the skills and tools learned at the workshop:

ACTION	RESPONSIBILITY
Climate change included in earth day: • Include come projections into • New games	• Tammy Jo and Christine
Sustainability Conference	• Adrienne, Tammy Jo, Val, Rocky—write abstract
Work with NOAA to develop 1-pager	• John, Chip, Mark, Val
Governor gets report from workshop	• Trina, Marybell, Val
Senior leaders (governor and president)	• Use this opportunity • Work with Sheena to get NRM in the meeting on CC • Sheena, Vangie, Mark Cabo, Ambrose
GVB and GHRA should meet with them (monthly meetings)	• Go through process with them • Walk to area and point out areas (threats/impacts) • e.g. runoff—algae blooms • Vangie, Tom, John M.
Sitting down with Humatak Foundation	• See what they are doing and expand on it—see CAP • Marybelle, Christine
Follow up / present to mayor's council; keep short	• Roland, John C.
Go back to agency and share information on CC with them	• Get the right messenger where needed • e.g. Mark Landerm Chip Guard
Develop different agendas of workshop for different audiences	• Meghan

In November 2013, President Obama selected Governor Calvo to participate in the State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience. Governor Calvo delegated Sheena Black as a co-chair for Guam's task force. Sheena participated in the workshop and presented information on this initiative. She also held a session where she asked workshop participants to provide insights about how the federal government can better incorporate Climate Change planning

into its policies and programs. This was an initial discussion and further plans were made to continue to gather information.

Finally, the learning exchange participants from the Caribbean shared information and presentations throughout the week on some of the climate change activities they are involved with in their islands. They also met the day after the workshop closed, to discuss how they might utilize the tools and skills learned at the Guam workshop in their island efforts.

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APPENDIX A: Overview Agenda

March 10	Session One

	• Background and Overview of Agenda and Tools
	• Telling Your Climate Story
	  • Reviewing Factors that Make a Community Healthy or Unhealthy
	  • Understanding weather and climate
	  o Historical Timeline Exercise
	  o El Nino/ La Nina
	  • Understanding Climate Change
	  o Causes of CC
	  o Predictions for Guam
	  o Seasonal Calendar Exercise

March 11	**Session One**

	• Telling Your Climate Story continued:
	  • What does Climate Change mean for the community?
	  o How will these changes impact a healthy community?
	  o How these changes impact a threatened community –Cumulative Impacts
	  o Review of Guam specific CC scenarios and impacts
	  • Is There Anything We Can Do?
	  o What are other communities doing?
	  o Adaptation Strategies
	  o Introduction to additional tools for corals/fisheries & coastlines
	  • Drafting a Climate Story

March 12	**Session Two**

	• Background and Overview of Agenda and Tools
	• Developing a Community Profile
	  • Community background
	  • Prioritizing natural resource and social targets
	  • Participatory mapping of community and its targets
	• Review of site specific information/models provided by NOAA
	• Threat and Vulnerability Assessment Field Work Preparation
	  • Review Climate Change concepts and vocabulary
	  • Review vulnerability assessment worksheets
	  • Team preparation
	• FIELD WORK (Afternoon) - Completing the Field Based Threat and Vulnerability Assessment for a community site (Umatic)

March 13	**Session Two**

	• FIELD WORK (Morning) - Completing the Field Based Threat and Vulnerability Assessment for a community site (Tumon) • Lunch Webinar – Saipan Vulnerability Assessment • Review vulnerability of targets and develop threat/action model to address root causes of threats and vulnerability – Prioritize actions
March 14	**Session Two**
	• Developing a Local Early Action Plan • Develop next steps to move climate change adaption forward in respective agency efforts and collectively • Report out to agency leaders (2hrs)

APPENDIX B: Guam Climate Predictions Summary

Guam- Climate Change Indicators & Impacts		
	Key Messages	
	Indicator	**Impacts**
Terrestrial		
Surface Air Temperature	Increase: warmer land particularly at higher elevations	Terrestrial habitiats, as well as human health, will be adversely affected as temperatures rise. Fire risk will increase.
Rainfall	Moderate increase: more rainfall, but with high interannual and interdecadal variability	Impact on freshwater supply will be limited.
Streamflow	Inconclusive	Inconclusive
Extremes - drought and heavy rains	Less and but more intense tropical cyclones, with high interdecadal variability	Episodic drought will continue to be a threat. Though perhaps less frequent, when they do strike the impacts of tropical cyclones will be more severe.
Coastal		
Sea Level	Moderate increase: rising mean sea level with high interannual and interdecadal variability	Incremental and episodic increases in tidal flooding of low-lying areas will occur in conjunction with incremental and episodic increases in mean sea levels.
Extremes - strong winds and high seas	Less and but more intense tropical cyclones, with high nterannual and interdecadal variability. Changes in location of extra-tropical strom tracks.	When coupled with high water levels due to storms, rsising sea levels will increase coastal flooding and erosion, damaging coastal infrastructure and habitat, and negatively affecting tourism.

Ocean		
Sea Surface Temperature	Increase: warmer ocean with moderate interannual and interdecadal variability	Increased bleaching and disease outbreaks in coral reefs. Along with existing stressors, this will adversely impact coral reef fish communities.
Upper Ocean Heat Content/Stratification	Increase in heat content. Decrease in stratification.	Chnages in the distribution of tuna and other fisheries.
Ocean Chemistry (acidification)	Increase: more acidic ocean (decreasing Aragonite saturation state).	Reduced coral growth and health. Along with existing stressors, this will adversely impact coral reef fish communities.
Threats to food and water security, infrastructure, health, and safety on low-lying islands are expected to lead to increasing human migration to high islands, adding to stress on high island social, economic, and environmental systems		

APPENDIX C: Tumon Community Profile

The Village of Tumon is located on the west coast of Guam and extends from the Hilton Hotel out to Two Lovers' Point and in to Marine Drive. There are approximately 9000 residents who live in Tumon. However, there are also approximately 100,000 tourists visiting Tumon each month or 1.2 million per year.

Most residents of Tumon are employed by the service industry or high income professionals such as military, doctors, lawyers, contractors, ice skaters, zoo keeps, teachers. There are also those who are Talaya (hook and line fishing). There are several active social groups in the area including recreational water users, church groups, political parties, service clubs (Lions/ Rotary), Guam Visitors Bureau, GHRA, Chamber, JFK, St. Johns.

The main stakeholders in Tumon include the Guam hotel and restaurant association, Guam visitors bureau, Chamber, Rotary (4 clubs), Recreation users—Paddlers, Long-term residents, and short-term residents (military, ice skaters). However, decision are made in Tumon through the Mayor and council. Some decisions are also legislated. Guam Visitors Bureau (GHRA too) provide input to decisions. Regulatory and infrastructure decisions are made through respective agencies including (DPW, GLUC, GSPC, EPA, GWA, DAWR, SHPO, Parks and rec, forestry)
Economics (hotel development)
Resource management

There are a variety features in Tumon that are strong and provide benefits to the community. It is a strong economic driver (from tourism) for the community and the island. There is a marine protected area that is improving resource health. There are also a gathering areas, parks, and recreational areas used by residents and tourists. Shops and restaurants are present and provide a wide variety of entertainment. Transportation around Tumon is easy as it is pedestrian friendly with sidewalks and include a trolly service. While Tumon is a high density development area, it has a strong representation of a business community in the area, and offers community events for all Guam residents.

The main threats or problems in Tumon include limited parking, Enforcement issues, invasive Coconut rhino beetle, Stormwater / flooding / and bacteria issues, XXX, Public access / parking challenges, Development issues, Chemical use / improper use, Beach maintenance, Vegetation removal, Recreation user impacts (physical damage), Coral bleaching, Drunks and crime and illegal dumping, and Seawalls.

Some improvement projects are underway and include sewer upgrades and infrastructure (including funding), hotels improvement at managing green waste, Recycling, Outreach, education resource signage, Tumon better than other villages in litter, LAC.

APPENDIX D: Threat Action Models

TUMON SHORELINE THREAT ACTION MODEL				
Actions	**Root causes of Threats and Vulnerability**	**Non-Climate Threats and Climate Vulnerability**	**Target**	**Impacts**
Identify & empower community champions & leaders	Importation of construction materials	Loss of vegetation	Shoreline	Erosion (loss of beach)
Identify leaders of orgs in the community to partner with				Loss of habitat
Work with mayor's office and church to id couple leaders in the community	Political interference (top down)	Improper development practices		Reduced food source from animals
				Loss of beach access/parking
Stop spot changes	Shift of values (cultural loss)	Stormwater flooding		Nutrient load to water
Write legislation				Increased algae blooms
	Increased population and tourism	Beach raking		
Conservaton easement program for coastal area				
Promote NRCS easement program	Lack of understanding / Apathy			
		CLIMATE		
Update water / land use regulation plans	Coconut rhino beetle	Storm surge		
Hire qualified attorney to review and update regulations				
	Lack / low enforcement (selective)	Hotter weather		
Importation mangagement improvement				
Eradication	New hotel ownership	Chronic flooding		
Improve enforcement	Economic short-term benefit			
Hire qualified engineers for regulatory agencies				
	Algae blooms			
Education / barrier removal				
Offer regular cultural/envir events	Aesthetics			
Tying cultural awareness with conservation in printed materials				
Business commity (triple bottom line)				
Political leaders				
New developments				
Alternatives or other development area				
Prioritize areas for protection				
Work with GEDA to develop incentives for shoreline preservation				

TUMON INFRASTRUCTURE THREAT ACTION MODEL				
Actions	**Root causes of Threats and Vulnerability**	**Non- Climate Threats and Climate Vulnerability**	**Target**	**Impacts**
Improve / maintain existing infrastructure	Poor planning / execution	Insufficient infrastructure	Stormwater drainage	Increased flood
Enhance other / upland means of drainage / regular maintenance	Lack of capacity (infrastruture)	Social vulnerability	Sewage infrastructure	Overwhelmed storm drains
Controlled development (master plan) "periodic review"	Too much water from roofs (little open space)	High rain events		Decrease in tourism
Carrying capacity (keep up with master plan)	Limited land and funding resources			Pandemic / disease
Educate kids	Political interence	High / med exposure		Degraded mari reserve
Educate voters to elect effective community leaders	Short-term thinking / planning	Moderate sensitivity		
Require / enforce stormwater regulations	Enforcement (lack of ability to fine violators / not pass through CCU)	Medium--economic driver		
		High dependence		

UMATAC CORAL THREAT ACTION MODEL				
Actions	**Root causes of Threats and Vulnerability**	**Non-Climate Threats and ClimateVulnerability**	**Target**	**Impacts**
Stream bank stabilization	Loss of cultural practices	Sedimentation	Coral reef	Decrease in coral (diversity growth, reproduction)
Unland revegatation	Lack of awareness	Algal blooms / overgrowth		Decrease in coral cover
Stormwater management	Upland fires	Coral bleaching		Loss of fish habitat
Manage wildfire threat	Terrestrial invasive species			Loss of food source
Riparian buffers	Improper road construction	CLIMATE		Loss of traditional fishing
Managing herbivorous fish stocks	Stream flooding	Wetter wet season		Rise in health issues
Community education	Cost / proximity / regulation / enforcement	Ocean acidification		Decrease in fishing safety
	Fishing (food, suplemental $)	Sea surface temperature increase		Lack of open space for cora settlement
	Agat-Umatac Road			
	Erosion			
	Setic / Toguan			

UMATAC UPLAND FOREST THREAT ACTION MODEL				
Actions	**Root causes**	**Threats**	**Target**	**Impacts**
Awareness program for hunters and residents	Lack of enforcement will	Fire	Upland habitat	Loss of cultural practices
Quantify cost of fires (response, health, services)	Low priority of Ags to prosecute	Coconut rhino beetle		Health
Community water towers	Lack of staff capacity in AG focus on higher priority issues	Invasive species		Economy
Engage prosecution / judiciary division better				Erosion
PDN article (roundtable to change arson law)	Culturally prized meat	CLIMATE		Poor water quality
Hire more conservation officers--Fire towers / surveillence points	Lack of enforcement capacity	Flooding (wetter wet season)		Loss of soil fertility
Sever penalties (brownbag with the judges)	Food	Drought (drier dry season)		
Elevate cultural value	Lack of enforcement (hard to prosecute)			
Pass biosecurity fee	High value			
Issue citation by COs	Apathy			
	People just like to burn			All areas exposed
	Poachers			High sensitivity
	Lack of awareness of environment			Low adaptive capacity
				Low term medium impac
	Lack of green waste management plan			Low adaptive capacity
	Improper green waste disposal			High cultural dependence
				High social vulnerability
	DoAg biosecurity division			
	Lack of Micronesian bio-security management plan			
	Lack of Guam invasive species management plan			
	Fragile system in weakened state			
	No natural seed dispersal			
	Lack of management capacity to revegetate			